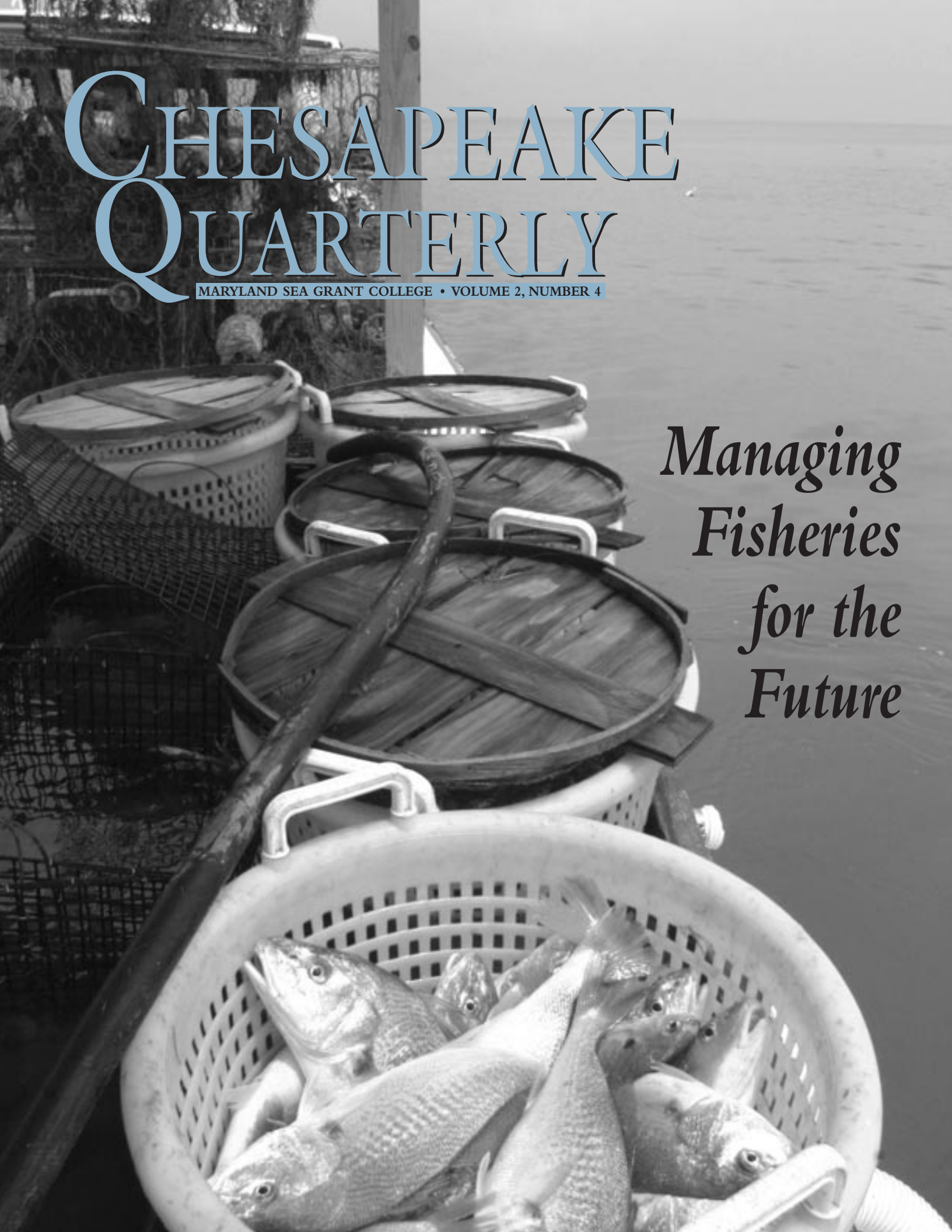

Chesapeake Quarterly

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Managing Fisheries for the Future

Contents

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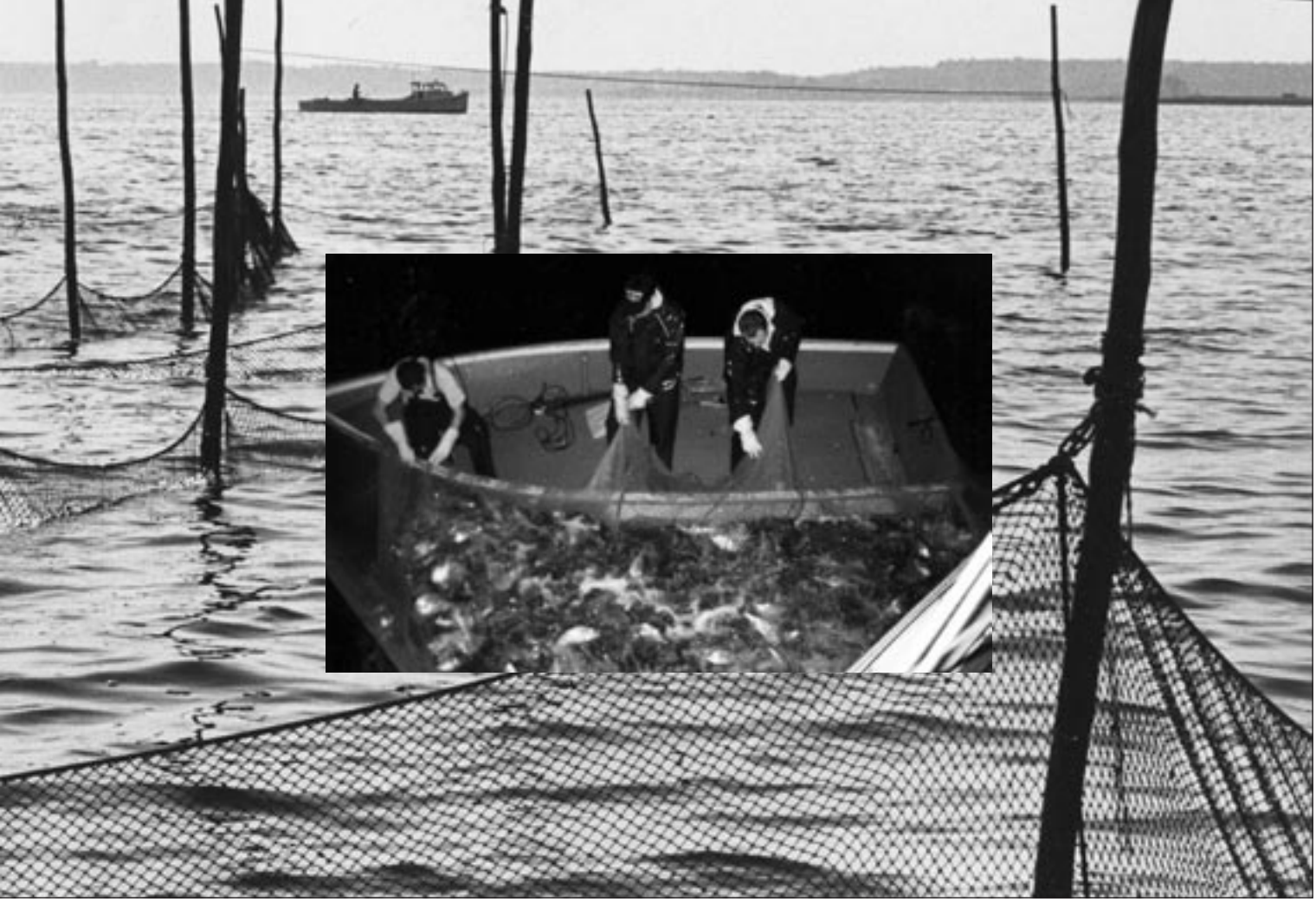
Cover photo: *Bycatch — like this basket of croakers on a crabbing boat — provides one example of how each fishery involves more than a single species.* **Above:** *A pound net on the Chesapeake; inset photo, waterman Bootie Collins's crew hauls in a pound net filled with stripers and other fish. Photos: cover and pound net on pp. 2-3 by Skip Brown; inset photo by Bootie Collins.*

Managing the Bay's Fisheries

The Search for New Approaches

By Merrill Leffler

How do our fishing practices affect the food web that supports all life in the Bay, from forage fish to top predators? Scientists are seeking to better understand these interrelationships and develop more holistic methods of managing sustainable fisheries in the Chesapeake.



Deale, Maryland, 4:30 a.m. It's days before Thanksgiving and Keith "Bootie" Collins is steering his workboat the *Catherine C* through the cold dark of Rockhold Creek on the Chesapeake's western shore. Huddled in the cabin for warmth, he and his three crew are headed for the Bay's open waters to harvest fish from several pound nets. The season for pound netters, open since April, will shut down on November 29th. For eight months Collins has been steering the same early morning route — while he will bring in white perch, croaker, menhaden, sea trout, eel and several other species, his money crop is striped bass.

What was hardly a faint glow ahead becomes more visible — the yellow light on Collins' first pound net, about two miles out from shore. As the *Catherine C* gets closer, the crew — Bryan Clark, Johnnie Smith and 76-year old Raymond "Tuck" Fountain — pull themselves into rubberized suits, effortlessly despite the cramped quarters. Collins maneuvers the workboat parallel to the leading edge of the pound net's crib — the cul de sac or "pocket" where fish are trapped — and secures it to the poles holding up the rest of the net. All four hustle into the skiff they've been trailing and paddle around the back edge of the crib. Once they position the skiff parallel to the workboat, they begin gathering the net inch by inch, securing it to hooks on the skiff, drawing both skiff and netted fish closer to the *Catherine C*.

The swirl of fins at the surface represents a waterborne livelihood to Collins and his crew, but what they find in their nets will also tell another story — about what kinds of fish now live in the Chesapeake Bay, and how those fish are tied to changes in the Bay's ecosystem as a whole. For now the crew of the *Catherine C* focuses on bringing in their catch.

Climbing back onto the larger workboat, Collins and Smith begin lowering a mechanized dip net that Clark and Fountain, both wielding shovels, rapidly fill with fish. Hoisted over the *Catherine C's* rail, the dip net suddenly releases a silver torrent of fish onto the culling board. To an angler, this is an immense haul, hundreds of fish hitting the culling board, nearly all of them striped bass, with a smattering of white perch, eels, brim shad, even crabs.

What happens next emblemizes current fisheries management in action. After quickly eyeballing the stripers, and rapidly measuring those too close to call, Collins and Smith shove most of them through the open end of the culling board, and right back into the Bay.

According to Maryland regulations, stripers must measure at least 18 inches and no longer than 36 inches — none of Collins' catch comes close to the latter and relatively few meet the minimum. Resource managers refer to these released stripers as "discards," in this case undersized fish that do not meet legal minimum lengths.

SKIP BROWN

BOOTIE COLLINS

Hoisting a heavy dip net, *a crewman on Bootie Collins' boat (above) hauls fish from the pound net's "pocket." The season over for 2003, Collins (left) prepares to ready his boat for the next season.*

Collins and his crew hope that the ones they throw back will represent something of a silver lining, since they hold promise for a good season next year. But just how many of these discards will survive the physiological stress of being hauled up in the dip net, bounced on the culling board and shoved overboard remains uncertain.

For watermen like Collins, and for fisheries managers in the Chesapeake Bay, today's catch points to often frustrating realities and puzzling questions. For example, while some fish, like striped bass, may be plentiful, they may not meet size limits, and so don't meet the fisherman's needs. And while certain species, like striped bass, white perch, weakfish and croaker, have experienced population growth in recent years, other species, most notably menhaden and the valuable Bay blue crab, have declined. Meanwhile, oyster populations are at all-time lows and sturgeon and shad are off-limits to all fishermen.

What are the relationships between one species and another? How do current fisheries practices, such as throwing back undersized or illegal fish, actually preserve stocks? In what ways does the restoration of one species like striped bass potentially impact prey species like blue crab and menhaden or competitor species such as bluefish and weakfish? How do our fishing practices affect the food web that supports all life in the Bay, from forage fish to top predators?

Dealing with Uncertainty

These unknowns can be significant, says Ed Houde, a scientist at the University of Maryland Center for Environmental Science (UMCES) Chesapeake Biological Laboratory. Consider, for example, the numbers of fish discarded by all commercial fishermen in the Bay, let alone by recreational fishermen, where the impact of releasing fish may be just as great. What is the actual survival rate of those fish? What numbers should scientists use as they calculate "fishing mortality rate," a key variable in constructing fisheries models that resource managers employ to calculate a total allowable catch for stripers? Clearly a better understanding of the fate of discards in pound and gill net fishing, as well as in charterboat and recreational fishing, could affect conclusions based on these fisheries models.

Researchers and resource managers are no strangers to scientific uncertainty, and management decisions must often be made in the face of limited data and unanswered questions. The management of striped bass along the Atlantic seaboard provides a striking example.

Since the mid-1990s, commercial striped bass landings in Maryland have ranged from 1.6 to 2.5 million pounds a year. That wasn't the case some 20 years ago when, after years of record landings in the Bay and along the Atlantic coast, Maryland striper harvests plunged to a low of 446 thousand pounds.

Scientists searching for explanations for the decline looked at the impacts of water quality, of habitat loss, of contaminants, of overfishing. While all may have been implicated, research and monitoring pointed to overfishing as the key factor to address, partly because effective regulatory actions could be implemented quickly. Stripers were being heavily fished throughout their range — in the Chesapeake, where in any given year 70 to 90 percent of coastal stocks from Maine to North Carolina are spawned, during their exit out of the Bay, and in Atlantic coastal waters where they forage for four or five years before returning to upriver tributaries in the Chesapeake. In other words, many of the fish that produce the greatest number and highest quality eggs were being landed before they could ever get back, at least once, to their natal grounds.

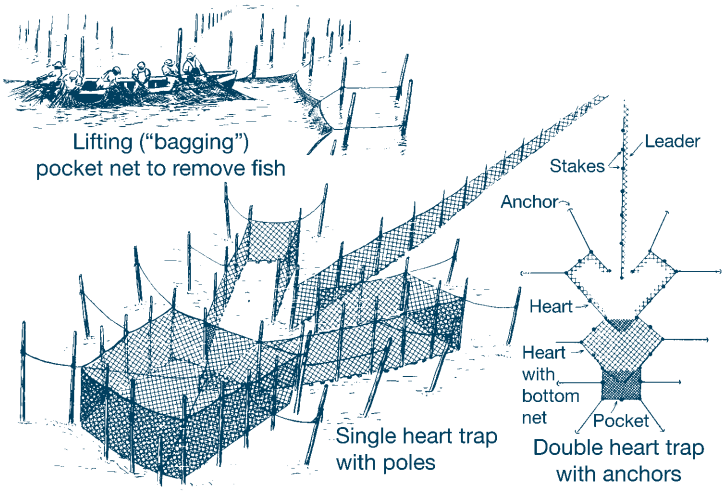
According to Houde, researchers concluded that rebuilding large stocks of

striped bass would require that a significant biomass of mature fish from different age classes — especially older and larger females with high reproductive potential — return to their spawning grounds.

Maryland and Virginia were already closing these grounds to fishing during the spring spawning season, but in 1985, Maryland went a step further and banned the taking of any stripers at all. The moratorium was followed by a coastwide strategic plan by the Atlantic States Marine Fishery Commission (ASMFC) to enable more mature striped bass to get back home. The plan established regulations that included raising minimum legal size (an index of age and maturity) and creel limits. Maryland lifted the ban in 1990 when monitoring gave strong evidence that "recruitment" of juvenile stripers was on the rise and different age classes were reaching their freshwater spawning grounds.

Today the ASMFC, with its state and federal representatives, sets a total allowable catch coastwide, allotting states from Maine to North Carolina a maximum quota (which they measure as "biomass"). Each state, including Maryland, then apportions that allotment among its fisheries. Bootie Collins, for example, is one of 157 pound netters in Maryland who in 2003 were allocated a total of 683,750 pounds. All who fish for stripers, whether gill netters, trawlers, hook-and-line fishermen or charterboaters, come under the limits of a specific allocation.

The restoration of striped bass has been hailed as a success story for rebuilding not only a major species, but a migratory one at that, a species that moves up and down the coast, returning to native spawning grounds in places like the Chesapeake Bay, Hudson River or Pamlico Sound in North Carolina, and crossing numbers of jurisdictional boundaries over numbers of years. Overcoming both scientific uncertainty and social and political obstacles to the development of a cooperative coastwide plan has made the striper a poster child for fisheries restoration. Can the striper's comeback serve as a management paradigm for rebuilding other species — by protecting spawning grounds and setting catch limits predicted to safeguard adequate reproduction?



In a pound net, *fish swim beside a long net called a "leader" that guides them into one or two traps called "hearts" and into the "pocket." Watermen gather the pocket net to haul in their catch. Drawing is from* Ecology and Management of Marine Fisheries *by George A. Rounsefell.*

Not wholly, says fisheries scientist David Secor, also at the Chesapeake Biological Laboratory (CBL). Controls on catch are obviously important, he says, and will have large effects, as evidenced in the striped bass recovery, but they are hardly the only answer. "They won't get us out of the hole we're in with sturgeon, with shad, and with oysters," he says. According to Secor, recovering these stocks will take a Bay that is more hospitable than it now is. It will take significant improvements in water quality, widespread recovery of submerged grasses and natural shoreline, which provide important habitat for young fish and molting crabs, and the rebuilding of active oyster reefs.

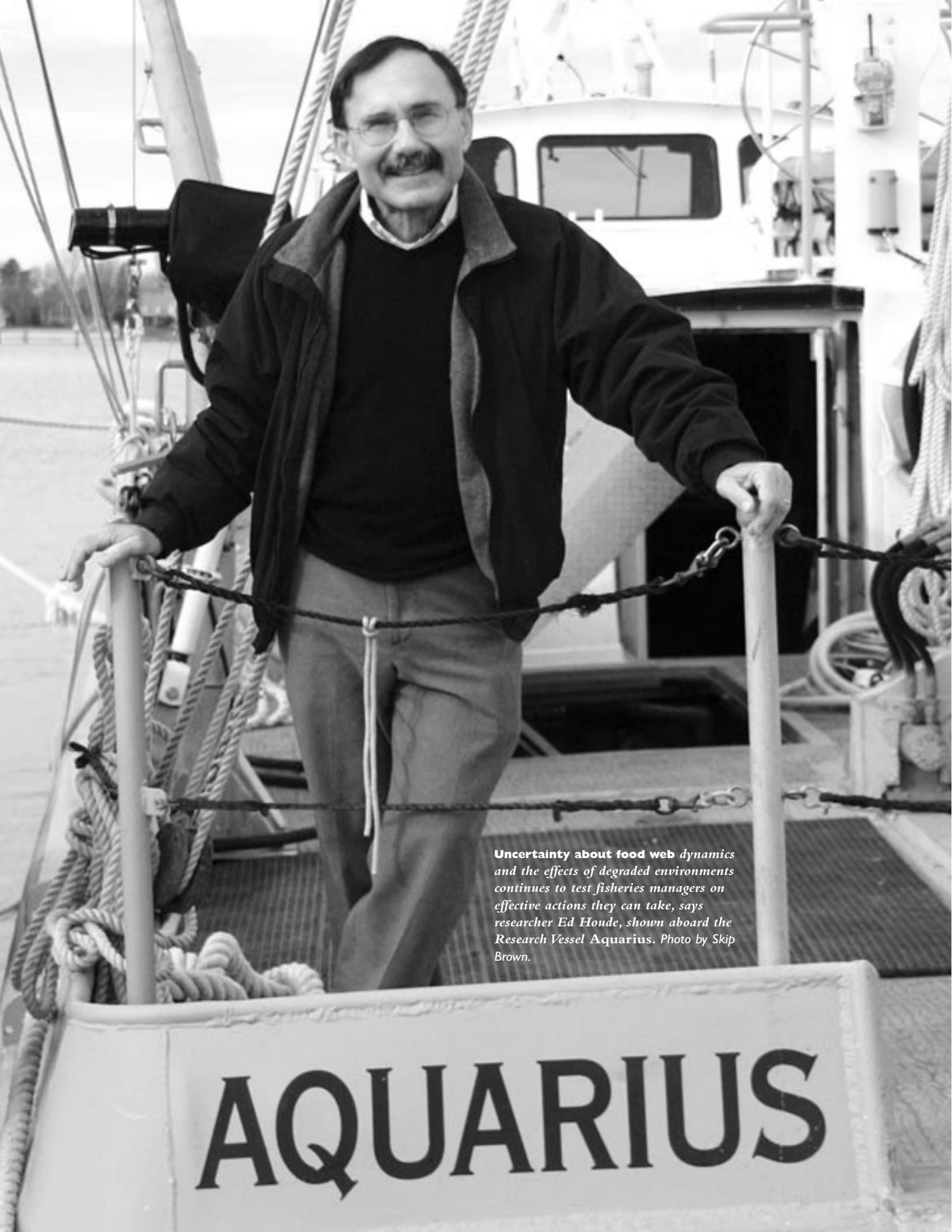
"We have to understand that we can't fix fisheries problems at every turn with increasing regulations," says Secor. "They are sometimes asked to do more than they can accomplish."

Beyond Controls on Catch

The return of striped bass has raised questions in recent years that weren't on anyone's mind two decades ago when rebuilding plans got underway. For example, how would increased striper stocks affect forage fish and other prey, particularly menhaden — the largest commercial fishery by weight in the Chesapeake? What would it mean for other popular species that also prey heavily on menhaden, for instance, bluefish and weakfish? What would it mean specifically for menhaden harvests, which account for 68 to 87 percent by weight of all commercial species, including blue crab, landed in the Bay?

Over the last 15 years, menhaden recruitments (i.e., the abundance of young produced) in the Chesapeake have declined substantially and remain low, Houde says. While dissections of striper stomachs reveal that menhaden still form a substantial part of their diet, they constitute less of that diet than they once did, he says. Striped bass are also consuming more of such prey species as anchovy, blue crab and other fish. Arguments have been put forth that the larger numbers of mature stripers and declines in menhaden have forced striped bass to feed on less nutritious prey — as a consequence, the argument goes, they are undernourished and susceptible to disease.

In recent years, large numbers of striped bass have been infected with *Mycobacterium*, a bacterial pathogen that can cause lesions and infect internal organs of what appear to be healthy fish. According to Andrew Kane, a fish pathologist at the University of Maryland College Park, as much as 70 percent of the adult stripers in the Bay may be infected. Where did *Mycobacterium* come from? It is sometimes found in fish raised in aquaculture systems, says Kane, and there has been some speculation that the



Uncertainty about food web *dynamics and the effects of degraded environments continues to test fisheries managers on effective actions they can take, says researcher Ed Houde, shown aboard the Research Vessel* **Aquarius.** *Photo by Skip Brown.*

microbe could have been introduced into the Bay years ago when cultured striped bass were stocked as one means of rebuilding populations. Or is *Mycobacterium* a natural constituent of the Bay? And if so, are stripers more vulnerable today than they were in years past because they are undernourished? There is no conclusive evidence so far that this is so, say both Kane and Houde.

Uncertainty about such food web dynamics and the effects of degraded environments continues to test fisheries managers on effective actions they can take, says Houde. Added to these are changing impacts of climate and weather, from tropical storms to El Niño to global warming, all of which may affect spawning success or failure in any given year. Altogether, the challenges may seem insurmountable.

That's not necessarily so, says Houde. While fisheries managers do not manage the ecosystem, he says, they do manage fishing activities. "If we can regulate those activities well, we can contribute to making the ecosystem better with respect to its support of fisheries." In effect, it's a two-way street — for fisheries to be managed well, the ecosystem has to be healthy; for the ecosystem to be healthy, fisheries must be well managed. We're looking to do fisheries management more holistically, he says.

Changes that the EPA Chesapeake Bay Program has been making in trying to improve water quality in the Bay system demonstrate how fisheries ecosystem management may be better integrated in the future. The Bay Program, for example, has moved from a long-time goal of reducing nutrients 40 percent Baywide as a key means for improving water quality toward identifying specific water quality and sediment goals for specific habitats such as spawning and nursery areas, shallow-water Bay grass areas, and deep-channel refuges. According to the Bay Program, "different criteria would be applied to each use based on the species found there, for instance, adult fish in open water, oysters in deep water, Bay grasses in shallow water."

Researchers need models that account for the complex food web relationships of each commercial or recreational species with their prey and between competitors for that same prey.

"I like to think of the ecosystem as the productive engine," Houde says. "We have to keep the engine in good shape, making sure that its productive capacity is maintained, such that wise stewardship benefits the fisheries." This means not only building age structure so that reproduction is not dependent only on one year class, as for striped bass, but it means "building biodiversity, building the biomass of a species, building predator-prey relationships, protecting habitat, and making sure that there is some reasonable part of the ecosystem that is protected from human activity." Setting aside areas protected from fishing can be controversial, though it is a spatial management tool that managers have been using for years. (See sidebar, Marine Protected Areas).

Biodiversity is one indicator of how healthy or robust the ecosystem is. Levels of production at higher trophic levels — layers in the food chain where one group of organisms serves as the source of nutrition for another group — are of special interest, Houde says, namely levels of predators (e.g., striped bass or bluefish) or prey (e.g., blue crabs or menhaden). "We want to maintain biomass diversity above threshold levels for those fishes we're likely to harvest."

Multispecies Management

Historically, state agencies like Maryland's Department of Natural Resources (DNR) manage fisheries on a species-by-species basis to try to achieve maximum sustainable yield, or MSY, a goal that aims at yielding the largest long-term average catch without reducing the size of the population. DNR's Nancy Butowski says that "we're trying to move away from MSY — it's based on populations being at equilibrium and most populations are not." According to Butowski, we need to consider the ecosystem as a whole, to move toward multispecies management. Focusing on a single species may leave little room for margins of error that result from unexpected impacts to the ecosystem, such as the large areas of oxygen depletion in bottom waters seen in 2003, partly the result of unusually heavy rains, nutrient runoff and widespread algal blooms. In recent years MSY is judged to be what fisheries scientists call a "threshold," a level of catch at which a species' sustainability is threatened. "Consistently fishing beyond a threshold level would significantly compromise the ability of a fish stock to maintain a certain population size and ultimately lead to a decrease," says Butowski. We need to set "targets" that aim at achieving an optimum yield that often is considerably less than MSY, she says, which takes into account multiple species.

To more effectively calculate "thresholds" and "targets," researchers need models that account for the complex food web relationships of each commercial or recreational species with their prey and between competitors for that same prey. As UMCES fisheries scientist Tom Miller has pointed out, if two species are related as predator (e.g., striped bass) and prey (e.g., menhaden), removal of prey by harvesting will mean fewer predators can be supported; conversely, removal of predators will mean more prey can be supported. These outcomes become more complex with more competitors (e.g., striped bass, weakfish, bluefish) for the same prey or, as often is the case, several prey (e.g., menhaden, bay anchovy, blue crabs).

For striped bass, peak years of landings were from the 1960s to 1970s, Miller says; they coincided with low bluefish and weakfish catches. "Commercial landings of bluefish only peaked during the mid to late 1970s, when striped bass catches were declining rapidly and weakfish catches were at low levels." Is there a

Marine Protected Areas

By Merrill Leffler and Jack Greer

BOOTIE COLLINS

Running down the center of the southern Bay, cutting a huge swath that nearly touches Virginia's Eastern Shore, lies a summertime crab corridor and sanctuary. From June to September, no one can catch crabs there — at least not legally — and so it becomes a veritable safe zone for blue crabs, especially female crabs ready to spawn.

Intense debate has circled the creation of this protected zone for crabs, which includes a sanctuary near the Bay's mouth and a mid-Bay corridor (in waters generally 35 feet deep or more) that reaches to the Maryland-Virginia line. Crabbers, cut off from fishing grounds, complain about its length and breadth. Some — especially in Maryland — complain that the sanctuary does no good, since crabs and crabbers don't use these deeper waters in summer anyway. Welcome to the world of marine protected areas, zones designed to preserve specific habitats and marine populations, and guaranteed to stir local controversy.

"Say No to NOAA," signs once read in the Florida Keys, where debates have raged over marine protected areas — a reflection of the depth of dissent over this practice. In the Chesapeake, where local jurisdictions hold sway over such inshore fisheries as oysters and blue crabs, the states of Maryland and Virginia, along with the Potomac River Fisheries Commission, control the establishment and management of protected areas, and also take the heat.

Though often contentious, the idea of protected areas is not new. When mapping oyster bars back in the 19th century, both Maryland and Virginia began to move toward the concept of zones — of defining areas for wild bars and for potential leased bottom. Similarly, when Maryland stopped the dumping of chlorine into striped bass spawning areas during spring, these areas became, in a sense, protected. And when a 1985 moratorium shut down fishing for striped bass in the Bay altogether, the Chesapeake itself became a kind of marine protected area, at least for striped bass.

Now the question arises of whether placing certain areas off-limits, especially for fishing, can provide a key tool for managing fish and shellfish in the Chesapeake. In addition to Virginia's blue crab sanctuary, Maryland has created a series of oyster sanctuaries, some to be harvested after a set number of years, others to be preserved for the long haul, to protect brood stock and to give native oysters a chance to adapt — however slowly — to the killing pressure of oyster parasites.

Proponents of such protected areas argue that they can help bring back a fishery. Researcher Rom Lipcius, well-known crab ecologist at the Virginia Institute of Marine Science, shows survey results that verify his claim that large numbers of female blue crabs reside in Virginia's deep-water sanctuary during the summer months. By protecting them from harvest, he argues, we greatly improve their chances of spawning, and of maintaining — or even increasing — the Bay's crab stock.

"Rather than tell people how much they can fish or catch, which is the usual way we regulate," says Ed Houde, "maybe we should at times consider the habitat as space that fish occupy and manage regions recognizing the heterogeneity of the ecosystem and estuary."

"We have a lot to learn about spatial management," says Houde, "but in general we know that if you don't fish in a portion of an area, you have more fish and they're bigger." This is not necessarily a trivial conclusion, says Houde, who chaired a National Academy of Sciences panel that recently published *Marine Protected Areas: Tools for Sustaining Ocean Ecosystems*. "If you have more fish and they're bigger, you've built up the spawning stock biomass and thus increased the stock's fecundity and age structure. So you have achieved those objectives, in some instances more efficiently than if you tried to regulate how much people catch."

Many advocates of marine protected areas think that you have to set up marine reserves that close areas from all exploitative activity to achieve their full benefits, which is to help protect the overall productivity of an ecosystem, says Houde. For a fishery manager, how much of an area one protects depends on what the sanctuary or reserve is expected to do.

"How much of an ecosystem should we put in a marine protected area?" Houde asks. "It's a question that's dogged a lot of people." The answer seems to be that if it is used as the primary way to manage a marine ecosystem for fisheries or otherwise, maybe 30 to nearly 80 percent. That is, of course, unrealistic, especially in any conventional fisheries management context. "Fishermen, commercial and recreational, would go crazy!" Houde says.

As he points out, however, combining conventional management tools along with protected areas can lead to much more acceptable approaches that require protection of less expansive areas. Combining area closures with seasonal closures, as is done in protecting spawning striped bass in the Bay, is an application of spatial-temporal management that is already applied as a supplement to conventional fisheries management.

Ultimately, Houde says, any decision about whether to implement protected areas management depends on what other effective mechanisms managers have in place and what specific goals are set. After all is said and done, he says, decisions about whether to adopt extensive spatial management measures rest on the goals and expectations of stakeholders and managers.

causal relationship? Did the reduced feeding pressure on menhaden by diminished striped bass populations benefit bluefish? Not necessarily, says Miller. "They are not simple replacements, although the same underlying fishing, trophic, and environmentally dependent mechanisms may drive the patterns."

Atlantic menhaden, a major schooling fish in coastal waters and Chesapeake Bay, are harvested and processed for meal and natural products, while the whole fish is used extensively as bait in blue crab pots. Over the 20 years before menhaden began to decline in the Chesapeake, their numbers and coastwide reproductive success were remarkably high, and consistently so, Houde says. Some people have argued that their diminishment has been caused by commercial harvesting, which is now more concentrated in the Bay than offshore.

Menhaden live in offshore ocean waters for the first 70 to 80 days of their life; they spawn on the near shore continental shelf where their eggs and larvae develop. Poor reproductive success and low recruitments could be attributable to failed survival in the coastal ocean rather than failed production in Chesapeake Bay. It has also been argued that increasing stocks of striped bass over the last decade have led to the decrease in menhaden. Harvesting and predation might be thought of as the two limiting factors on menhaden recruitment to the Chesapeake, says Houde, and could serve as an argument for reducing menhaden harvests in order to leave more for striped bass and other popular species. Or it might be argued that striped bass harvests should be increased to reduce the pressure on menhaden — after all, menhaden is also a commercial species. While this is a management-stakeholder decision, he says, "there is not a lot of evidence that increased menhaden harvests and striper predation have caused menhaden recruitment failure."

Further complicating the issue over such a multispecies management issue is the potential ecological role of menhaden, since they are significant con-

sumers of phytoplankton, the single-celled algae that metabolize nitrogen and phosphorus. With nutrient overloading to the Bay and an overabundance of algae seen as key determinants in the decline of water quality, some have associated this decline with decreasing numbers of menhaden. It's an appealing hypothesis, yet there is very little evidence to support it, says Houde.

It's possible there's been some climate or weather change over the last 15 years that we haven't picked up that has caused lower survival of menhaden eggs and larvae in the coastal ocean, says Houde. But as he goes through a stream of speculative hypotheses, he is quick to add, "We can't say there is good evidence to support this either." We would have needed to set nets at the mouth of the Bay from January to April in a series of years and look at flux of young menhaden to know if there's been a decline in the input. That would be the ideal kind of study, he says. "It sounds simple but it's a big undertaking, and I don't know if anyone would want to fund it."

With all this uncertainty just over the role of menhaden, how are resource management agencies to manage multiple species at one time, let alone take into account ecosystem factors? Given that marine research cannot yet incorporate multispecies and ecological information into models to reliably forecast the implications of different management alternatives, Houde's answer is that the best course lies in adopting the ethic of doing the least amount of harm or no harm to the ecosystem in the face of great uncertainty.

A Changing Ethic

Doing the least amount of harm through fisheries management means taking a "precautionary approach," an ethic that has been embraced globally and has been gaining momentum in the United States, including the Chesapeake Bay. In essence it means not taking actions in fisheries that will risk the long-term sustainable yield of fisheries productivity we want to exploit. It means, for example,

Houde's answer is that the best course lies in adopting the ethic of doing the least amount of harm or no harm to the ecosystem in the face of great uncertainty.

that "you need to consider your activities before you risk destroying habitat," Houde says, "before you risk destroying predator-prey relationships that are important in supporting the productivity of those fish you want to harvest."

Still, the precautionary approach is not without controversy — it reflects a change from traditional management in that it is "risk averse." As Paul Dayton remarks in *Science* magazine, "resource management faces strong economic barriers to risk-averse strategies. These polices cannot be expected to be implemented until the burden of proof is placed on exploiters of public marine resources to prove that they do not cause damage rather than simply assuming this to be the case until demonstrated otherwise."

The United Nations Food and Agriculture Organization (FAO) has been a strong advocate of the precautionary approach and risk-averse management and has sponsored international meetings of all fishing countries and produced documents with a wide impact. "In management plans in most fishing countries around the world," says Houde, "people have bought into the precautionary approach." Fisheries councils and commissions in the nation's coastal regions are beginning to adopt approaches that reflect this. For example, the Atlantic States Marine Fisheries Commission, which manages Atlantic menhaden stocks on a coastwide basis, adopted an amendment to the Menhaden Fishery Management Plan in 2001 that contains a new overfishing definition for the Atlantic stock that uses a "fishing target and threshold" and "stock size target and threshold" instead of MSY, maximum sustainable yield. Targets and thresholds are measures of how the precautionary approach could be adopted, says Nancy Butowski. Maryland DNR has a commitment to multispecies and ecosystem-based fisheries management, she says, and has recently selected five key species — oysters, blue crabs, striped bass, menhaden and alosids (a collective term for all four Alosa species — American shad, hickory shad, alewife and blueback herring) — to begin with. "We will be spending a lot of time on how to revise and amend the fishery management plans for these species."

What considerations would need to be taken into account if the striped bass fishery was managed from a multispecies and ecosystem-based perspective rather than on a single-species basis? While we would first of all want to protect water quality, Houde says, we would also want to preserve some part of the menhaden biomass for consumption by striped bass. To do that, "we would need to determine what level of biomass is needed to sustain a healthy striped bass population in the Chesapeake. We would need to know about the role of anchovy and blue crabs as alternative prey. We would also need to know the impact of different anchovy and menhaden levels on consumption of crabs by striped bass. For example, if anchovy and menhaden consumption increases, what will it mean for the consumption of crabs? If striped bass catch is to be maximized, what will this mean for other species, both predators and prey? What are the interactions between striped bass and menhaden: can we expect to have more or less phytoplankton if we fish one or the other?

To answer such what-if questions, managers need to employ fisheries models that can offer some assurance about their predictive trends. Such models must be able to integrate food webs and a host of ecological parameters. In the last several years, the NOAA Chesapeake Bay Office has been working with scientists and resource managers on adapting three sets of models, Ecopath, Ecosim and Ecospace. The models begin with snapshots of food web relationships (Ecopath), while Ecosim

A Fisheries Ecosystem Plan for the Bay

By Merrill Leffler

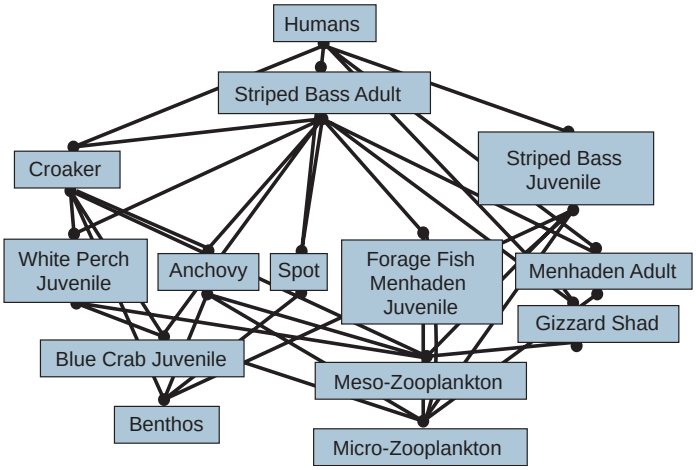
"It's the habitat, stupid!" reads the poster overlooking Margaret McBride's desk. A fisheries scientist at NOAA's Chesapeake Bay Office, McBride chairs the technical advisory panel of regional scientists and managers that was charged to develop a Fisheries Ecosystem Plan (FEP) for the Chesapeake Bay. Ed Houde, a researcher at UMCES Chesapeake Biological Laboratory, joined as co-chair of the FEP Panel. The soon-to-be released plan sets out a comprehensive strategy for new approaches to managing fisheries in the Chesapeake — approaches, McBride believes, that could help prevent the kinds of devastating losses that have occurred in the Bay's oyster, sturgeon and shad fisheries.

"The Bay has an open access fishery and everyone is entitled to fish," she says. "But everyone has to recognize as well that there's not an inexhaustible supply of fisheries resources and that there are things we have to do to help ensure productivity." Traditional ways of managing fisheries have largely focused on controlling landings through numbers of regulations governing seasonal fishing, creel and size limits, gear restrictions or a combination of these and other regulations. But controls on fishing are not enough, she says. "If we're going to handicap nature by degrading the environment that we want species to thrive in, then we have to rethink our strategies."

The Fisheries Ecosystem Plan begins with the premise that if Bay fisheries are to be conserved, then fishery management plans will have to account for factors often overlooked in the past — while these include the role that habitat and predator-prey relationships play in promoting sustainable landings, they also include social and economic considerations and "externalities," for example, climate impacts that may occur unpredictably.

The idea of an FEP for the Chesapeake had its inception in 1996 legislation aimed at ocean fisheries. Under the Magnuson-Stevens Fishery Conservation and Management Act, as it was named, Congress directed NOAA's National Marine Fisheries Service (NMFS) to examine how regional management councils were applying ecosystem principles to managing coastal waters. The country's eight councils help set fisheries policy in coastal waters from 3 to 200 miles offshore. NMFS appointed an Ecosystem Principles Advisory Panel, whose members came from industry, academia, conservation organizations and fishery management agencies — Houde was a member of that panel.

The NOAA Bay Office, together with the Bay Program, first brought scientists and managers together for a workshop in 2000 to examine the feasibility of an ecosystem-based plan for the Bay. Such a plan had promise for Bay fisheries, workshop participants concluded, because the Chesapeake Bay Program's restoration efforts are geared to significantly improving water quality and habitat. "The waters of the Chesapeake Bay are not federally managed so there was no mandate driving us to do this," says McBride. "Rather we felt that an FEP was the best way to try to improve our fisheries here, and at the same time provide a pilot that would facilitate FEP development nationally."



This subweb of striped bass *showing the interrelatedness of species gives an idea of just how complex one small part of the ecosystem can be. Redrawn from a draft of the Fisheries Ecosystem Plan.*

The FEP Panel appropriated the NMFS panel's approach by focusing on key issues, among them, defining the geographic extent of the Bay ecosystem, producing conceptual food web models for commercial species that include detailed descriptions of predator and prey species at each life history stage, assessing the role of predictive uncertainty, habitat requirements, identifying the available long-term monitoring data and examining social and economic dimensions of ecosystem-based management of Bay fisheries.

"This is a strategic plan, not a tactical one," says McBride. "It doesn't specify step by step how resource management agencies are to undertake ecosystem-based fisheries management. In many cases the particular steps will need to be developed by managers." Rather, she says, the plan lays out what we know now, what additional information managers will need to know and the kind of research and monitoring needed to provide that information in order to help managers and stakeholders balance conservation and removals, whether in commercial harvesting or recreational and charterboat fishing.

McBride doesn't see immediate, major changes in fisheries management. "For example," she says, "multispecies management is the direction we're moving toward, but all the necessary tools are not yet in place." Fisheries management decisions in the states will still be on a species-by-species basis, she adds, but they will now begin taking additional considerations into account before they make those decisions. Our immediate focus is the Chesapeake Bay, but we have to go beyond that to manage within an ecosystem context, because many species are not just relegated to the Bay — striped bass, eel, menhaden are coastal species that use the Bay at different life stages. For such species, management actions must be coordinated between Bay and coastal jurisdictions, taking all life history stages into account.

These changes, says Nancy Butowski of Maryland's Department of Natural Resources, will be reflected in the fishery management plans as "we begin to assess how to best incorporate them."

What the FEP will do is provide guidance for an ecosystem-based approach to fisheries management; it will also direct the types of research and monitoring that need to be undertaken, McBride says. "We envision it to be a living document, one that will evolve as we learn more about fisheries within the context of the Chesapeake Bay ecosystem, and as management needs change." A major point, she emphasizes, is that ensuring viable fish habitat is not just a fisheries management issue, and certainly is not something that fishery managers can do alone. "The kind of management we're talking about," McBride says, "entails a paradigm shift: How do we change the way we do business to not have a negative impact on fish habitat?"

To find out more about the Fisheries Ecosystem Plan, see the NOAA Chesapeake Bay website at noaa.chesapeakebay.net/fepworkshop/netfep.htm

adds in the behavior or vulnerability of a group of organisms; Ecospace takes the Ecosim model and, in effect, makes it into a movie. This enables managers to pose the what-if questions, says NOAA's Alisdair Beattie. "We don't use the models to predict absolute abundance," says Beattie, "but we try to re-create patterns of abundance that occurred in the past." If the model can hindcast such patterns, then it could potentially be used to try to forecast the impact of different fishing policies, a useful tool for resource managers.

While models come with inherent uncertainties, even when they are "validated," the best are limited by the quality of data they employ. A 1998 report that first explored the potential of multispecies management in the Chesapeake concluded that the monitoring of economically and ecologically important species then underway was inadequate for estimating abundance and providing critical biological data. Today, two major monitoring projects are underway in Maryland and Virginia, CHESFIMS and CHESMMAP, respectively (see sidebar, The Need for Monitoring). These Baywide surveys measure abundance, diversity and recruitment success of key species and will be important for emerging multispecies management.

The Chesapeake Bay Program is committed to begin multispecies management by 2007. The kinds of changes watermen like Bootie Collins will face are as yet uncertain. These changes could eventually be reflected in different allocations for striped bass or regulations related to handling bycatch. "There could be times and places," says Houde, "where certain kinds of gears and certain kinds of fishing should not take place, for instance, if you don't want to catch too many young fish of a target species or a fish that supports target species or a threatened species." There might be kinds of fishing that can be avoided or minimized in some areas. In the long run, it could make a difference for pound netting and gill netting, he adds. For now, Collins and his crew can expect to keep discarding stripers that don't measure up, or to change to more selective gear that will accomplish the same ends more efficiently.

The movement towards ecosystem-based fisheries management does not reflect a revolutionary change; rather it reflects an evolution that has intensified since the early-1970s, when the first scientific papers on multispecies issues appeared. Calls for new ways to manage our fisheries have intensified worldwide as scores of popular species have become unsustainable for commercial harvest and important habitats have been destroyed by pollution and by fishing practices themselves. The Chesapeake is no stranger to this phenomenon: oyster reefs hardly exist anymore and underwater grass habitats are a fraction of what they were; meanwhile, species like sturgeon and shad that once thrived are so depleted that fishing for them remains forbidden.

Bay Program commitments to reversing declines in water quality and to rebuilding habitats provide a basis for holistic approaches to managing the Chesapeake's fisheries. The traditional single species approach, primarily for controlling catch, helped solve certain problems in the past, but it often overlooked others. Whether successful ecosystem-based management will mean that we can have both abundant fish and blue crabs, both large menhaden harvests and healthier, fatter striped bass in Bay waters remains to be seen — undoubtedly, there will have to be tradeoffs. The role of fisheries research in this case is to provide the tools that will give managers and stakeholders a measure of confidence in facing the tough choices that lie ahead.

The Need for Monitoring

With multispecies management in the Chesapeake scheduled to get underway in 2007, state management agencies will be looking for help from fisheries scientists — and models such as Ecosim-Ecospace-Ecopath — to help assess the implications of alternative policies. For example, if monitoring of striped bass populations suggests that catch limits could safely be raised, managers could use models to assess potential impacts on croaker, weakfish and bluefish with regard to common prey such as menhaden. They could also ask how such an increase is likely to affect menhaden directly or blue crabs. Models are a tool, says Alisdair Beattie of NOAA's Chesapeake Bay Office. "We don't go to them to give us absolute answers," he says, "but we can use them to predict the expected directions and relative magnitudes of fishing policies."

The best models, meaning those that well characterize food web and related processes, are only as good as their data. Despite the fisheries monitoring conducted by both Maryland and Virginia over the last several decades, the kind of data scientists need, especially on predator-prey or food web relationships, has been sorely lacking. To begin obtaining those kinds of data, the NOAA Chesapeake Bay Office is supporting survey efforts at two research laboratories, the University of Maryland Center for Environmental Science (UMCES) and the Virginia Institute of Marine Science (VIMS).

At the UMCES Chesapeake Biological Laboratory, Tom Miller is overseeing the Chesapeake Bay Fishery-Independent Multispecies Survey (CHESFIMS), a collaborative effort with the Maryland Department of Natural Resources that conducts intensive bi-monthly surveys of the mainstem Bay and shoal water areas (depths less than 30 feet that border the mainstem Bay). They've been compiling details on species that are most prevalent by number and weight. In 2002, for instance, in May and July, Bay anchovy was the most frequent species coming up in nets, but they were third and fourth in biomass, respectively, compared with blue crab, which led all species. These data, says Miller, will help researchers determine the food web relationships that are essential for multispecies models.

At VIMS, Chris Bonzek is heading up the Chesapeake Bay Multispecies Monitoring and Assessment Program (CHESMMAP), an extensive survey effort that complements the CHESFIMS program by targeting larger fish in the Bay mainstem. "Monitoring is not glamorous," says Bonzek, "but it is critical if we're going down the path of multispecies management. We need long-term data on patterns of feeding habits," he says, for example, "to better understand changes that could be occurring in the Bay and which our models will have to account for." Visit their web sites to see survey findings from both programs at http://hjort.cbl.umces. edu/chesfims.html and www.fisheries.vims.edu/chesmmap.

Portrait of a Monument

Remembrance of Things Past

By Michael W. Fincham

Commercial fishing in Kent Narrows is in dire straits — but you wouldn't know it on this mild November morning with nearly three hundred people milling about in the sunlight in front of a makeshift stage. They've come here to the east side of the Narrows to watch the unveiling of a new statue honoring one of the state's oldest professions. It's called the Maryland Waterman's Monument.

At 10 a.m. sharp, George O'Donnell strides to the podium and calls the crowd to order. "The purpose of this day is to purely honor the watermen of the state of Maryland," he announces. With his broad face, grey black mane and basso profundo voice, O'Donnell makes a genial Master of Ceremonies for the day. A fifth generation waterman, he had to quit the business a decade ago to find better-paying work on land. "It was not a good way to make a living anymore," he explains later. Too many days with not many oysters. "Long story short: the bad outweighed the good."

Today, however, is all good for O'Donnell. The brainstorm to build a monument first struck him over seven years ago while he was serving on the Kent Narrows Development Foundation. This unveiling is the payoff for years of endless organizing and fund-raising by him, his wife Camille and his friend, Tilghman Hemsley, the man he asked to create the monument. Though he left the water for careers in county politics and business, he never lost his love for the history and culture of commercial fishing along Kent Narrows.

Most Marylanders barely notice the Narrows, a thin channel dividing Kent Island from the rest of the Eastern Shore. They race across, well above the water, on a high-arching six-lane bridge built back in the 1980s as part of the state's "Reach the Beach" construction program. Down below the bridge, the new Narrows is now home to half a dozen seafood restaurants, two hotels, dozens of new condos and several marinas crammed with high-end cabin cruisers and sailboats.

Before the high bridge went up, all those cars and buses funneled over a small two-lane drawbridge at Kent Narrows. That's where all the Ocean City beach traffic would back up, as the bridge periodically cranked up to let sailboats and workboats slide through the Narrows. Caught in the bottleneck, beach-bound families could glimpse the world George O'Donnell remembers.

When the Chesapeake Bay was still thick with fish and shellfish, the Narrows was a parade ground for skipjacks and bugeyes and buyboats and deadrise workboats outfitted with odd-looking gear for all kinds of commercial fishing: hand tonging, patent tonging and oyster diving; crab potting and trotlining; drift netting and gill netting and pound netting. Anyone who loves a parade could pull off the road and watch. Or better yet: buy fresh oysters and crabs and clams right at a dozen docks where the boats were unloading.

The crowd for today's unveiling has more locals than tourists and plenty of watermen, more from the past than the present, with their baseball hats set squarely over sunburned faces. A Catholic priest gives a quiet invocation. A burly ex-Marine booms out a soulful National Anthem that can be heard all over the east side of the Narrows. The ceremony, full of speeches with food and drink to follow, has the air of an Irish wake, more celebration than mourning but tinged with loss and regret.

Off to the side stands the monument, a mute hulk draped in black. After several eulogies for a way of life that is passing and a few promises from state officials about a better fishing life to come, the mourners and celebrants file over to the monument to pay their first respects.

The hook and ladder company from Grasonville slides a ladder out over the statue. A fireman in work blues quick steps up the rungs, then hooks and slowly hoists the black drape — unveiling a scene out of an earlier era.

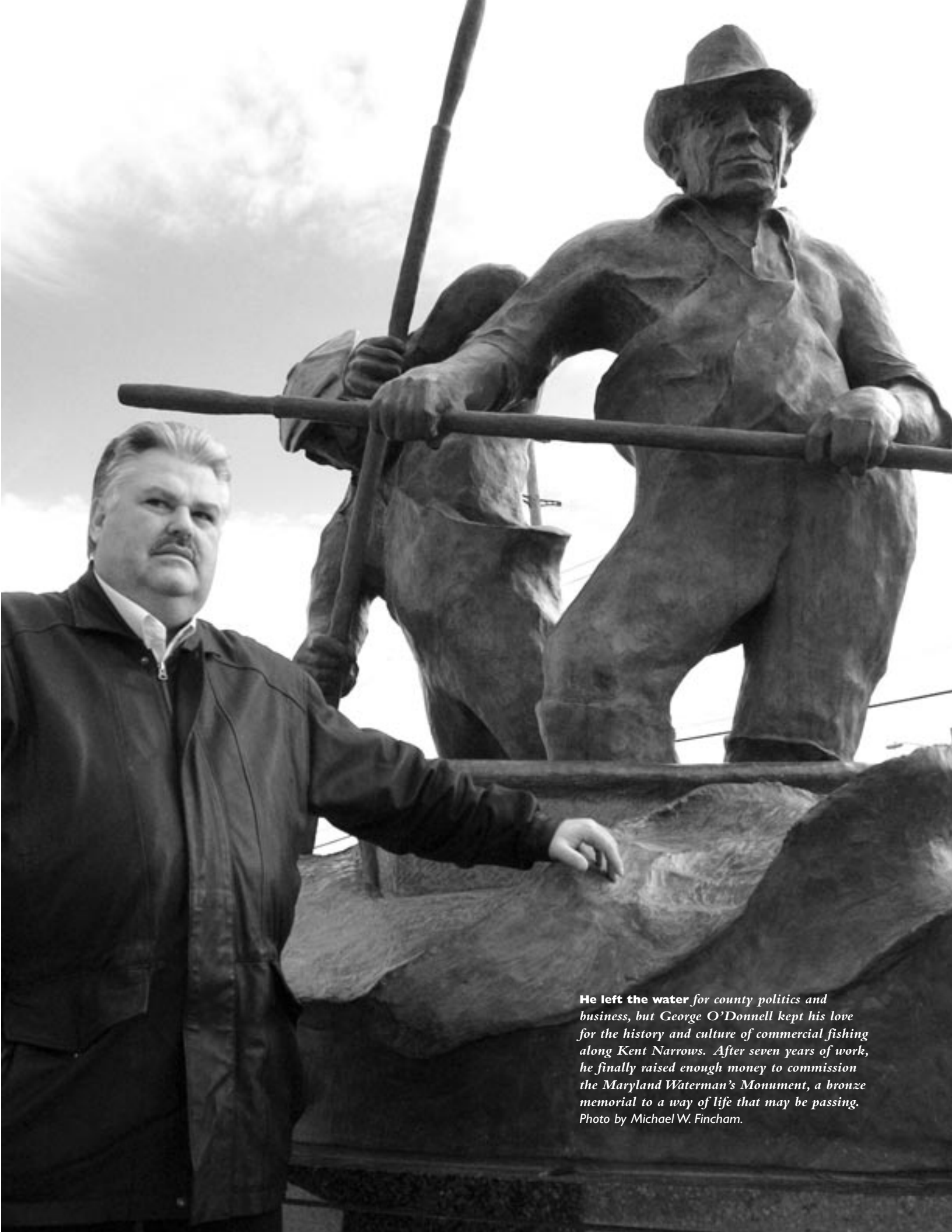
Atop a base of granite two watermen of bronze stand nine feet tall in the bow of a small skiff, oars at the ready. In the bottom of the boat, a couple of rockfish lie among the nets used to catch them. One waterman wears a beat-up slouch hat, a cross between a creased fedora and a narrow-brimmed straw hat. The other sports an old-fashioned "newsboy" cap out of an old movie.

The hats and the oilskins and the boat all suggest a style of fishing from decades ago, according to O'Donnell. A large power boat would tow out a small bateau. A couple watermen would climb into the bateau and pull their way along staked nets, throwing fish in the back before paddling back to the lead boat.

The image behind the statue comes from another time, specifically from a photograph. "It was just an old snapshot," says Tilghman Hemsley, the painter who became a sculptor in order to create this monument. "But man, that to me, looked like that era back in the 1910s."

From the photo he created a sketch, then a small model that he and George hauled around to dozens of meetings, hoping to raise a quarter million dollars. For the final statue he kept the old hats and oilskins and downplayed the net gear, nearly hiding it in the boat. His watermen are not necessarily netters or crabbers or oystermen. "I wanted to leave it open for everybody," he says. He was going for the essence of watermen, and for Hemsley the essence was the emotion in the image. "That was the heart and soul of the feeling of watermen," he says.

A brown-haired man still sunbronzed in November, Tilghman Hemsley IV carries an old Eastern Shore name that was carried before him by forefathers and uncles who were engineers. But Tilghman #IV chose art over engineering. "You've got to take what you're good at — which was not engineering," says Hemsley. "I didn't even try it." After training in Baltimore at the Maryland



He left the water *for county politics and business, but George O'Donnell kept his love for the history and culture of commercial fishing along Kent Narrows. After seven years of work, he finally raised enough money to commission the Maryland Waterman's Monument, a bronze memorial to a way of life that may be passing.* Photo by Michael W. Fincham.

Institute College of Art, he came back to the Shore and tried to carve out a double career. As a working artist, he painted portraits on commission; as a working waterman he scrubbed decks, cooked and caught fish as a first mate on charterboats. For the last twelve years he has captained his own boat.

As an artist Hemsley says he works in the tradition of realism, trying to capture life as he sees it. Life as he paints it, however, does not fit the "picturesque" tradition of Eastern Shore scenes popular with tourists. Instead of snow-covered boats floating in a winter harbor, he's more likely to paint the inside of a boatyard where a waterman is banging around trying to fix something on his workboat. "To me it's the most typical Eastern Shore scene. It is the backbone of what you do," he says. "Because you are always breaking stuff."

When George O'Donnell asked Hemsley if he could find someone to build a monument to watermen, the artist — who had never tried a large sculpture — thought about it for a second, then said, yeah, he could build it. "Whatever it takes, we'll figure a way to do it."

A moment's decision started a seven-year odyssey in fund raising for both of them and a new education in sculpture for Hemsley. Once the indomitable O'Donnell raised some money, Hemsley had to figure a way to turn a sketch and 15-inch clay model into a bronze sculpture with larger-than life watermen standing 9-feet tall in a skiff nearly 13 feet long.

The experts at the New Arts Foundry in Baltimore told the painter he was crazy to start off with a sculpture that large. "Sometimes the things you do, you got to be a little bit dumb to do 'em," says Hemsley. Or a little bit stubborn. As a waterman, Hemsley was willing to work hard. As an artist he was willing to become an engineer of sorts.

He built a studio, 20 by 30 feet. Then he contrived a platform on wheels that could break away into six sections. Later came piping that he bent and welded to create a skeletal structure. Big foam blocks that he chainsawed into chunks to create shape and filler. Finally a clay exterior that he kept carving and shifting around until the proportions matched his model.

MICHAEL W. FINCHAM

Painter and charterboat captain, *Tilghman Hemsley became a sculptor to honor Bay watermen.*

Like watermen with leaky boats, painters who would be sculptors learn to be problem solvers or sink at sea. Helping with the heavy lifting were his son and Tom Callahan, a neighbor and farmer who proved handy with pipe bending. By the middle of the project Hemsley's studio looked a little like a workshop in a local boatyard.

Once Hemsley and his crew finished the pipe-and-foam-and-clay version, they had to cut it apart and ship it off in sections to the experts in Baltimore. There the specialists at the New Arts Foundry took over, creating molds, casting dozens of small bronze panels, and then welding them all together. This is the shop that turned out monuments and busts honoring Marylanders as famous and diverse as Babe Ruth, Thurgood Marshall, Jim Henson, John Unitas and even Louis Goldstein. To that list they can add a monument to unknown watermen.

After the final welds, these bronze watermen look like stylized figures out of an earlier era in art history. With their blocky bodies, outsized heads and work poses, they could walk out of a painting from the Social Realism school, a movement by American artists of the early 20th century who focused less on creating "beautiful" art and more on showing life "as it existed," especially the life of working-class people.

The final objet d'art is certainly a big hit with the (mostly) working-class crowd gathered on a Saturday morning at Kent Narrows. There is loud applause after the unveiling, followed by long lines of spectators slowly circling the sculpture, men and women reaching over to touch the bronze, then stooping to read the names engraved along the granite base.

"It's historic. It's something this community needs," says Karen Ortel, one of the onlookers. "Our history is ingrained in the watermen and the processing industry that was here." She is circling the monument with her father, W. H. Harris, whose name is one of those now ingrained in granite. In 1947, he founded Harris Seafood, the only seafood packing house now left along the Narrows.

Though a monument can't bring back oysters and shucking houses, the locals believe it can bring some of that whizzing traffic down off the high bridge and help Marylanders rediscover Kent Narrows. What they'll find is a statue of 9-foot watermen standing just off the two-lane highway crossing the old drawbridge. To the south and north are the seafood restaurants and marinas that form the business heart of the Narrows today.

For O'Donnell, the waterman-turned-businessman, the monument symbolizes hope for the future. "People think of watermen as independent, but this particular scene, it shows their dependency on each other: Each one is paddling their respective side of the boat. That shows the crew concept," says O'Donnell, "the notion that a lot of people are going to have to work together if there is going to be a way of life in the future."

Hemsley, the painter-turned-sculptor, is less sanguine about that future. "If something happens and the waterman's gone, nobody will know anything about them," he says. But the monument will be there and people who wander down off the high bridge will wonder what it means. "They are going to say what's that? And they'll say: 'It's a waterman. They used to go around here and make a living out on the water.' "

The bronze watermen are mute on the future. Larger than life, with their outdated hats and oilskins, they loom above the people milling around the monument. They face north towards the high bridge and the racing traffic. They seem to be paddling somewhere, perhaps on to the next net, perhaps over to another boat, perhaps back to another time.

Knauss Marine Policy Fellows for 2004

Three University of Maryland graduate students — one in the Conservation Biology program and two in the Marine-Estuarine-Environmental Science (MEES) Program — and one student from Georgetown University Law School are recipients of four Knauss Marine Policy Fellowships for 2004. The fellowship program, begun in 1979 and coordinated by the National Oceanic and Atmospheric Administration (NOAA) National Sea Grant Office, provides graduate students across the country with an opportunity to spend a year working with policy and science experts in Washington, D.C.

Named after former NOAA administrator John A. Knauss, the Sea Grant fellowship program was established in 1979 to match highly qualified graduate students with hosts in the legislative branch and executive branches of government or with associations and institutions located in or near Washington, D.C.

Jen Bachus will work with both the Marine Mammal Division and the Endangered Species Division within NOAA's Fisheries Office of Protected Resources. Her focus will include analysis of "Take Reduction Plans" for reducing by-catch in fisheries and for development of recovery plans for several species of cetaceans. Bachus received a B.S. in biology and a B.A. in Spanish from the University of North Carolina at Chapel Hill in 2000. She worked at the Skidaway Institute of Oceanography in Savannah, Georgia, prior to entering graduate school at the University of Maryland in College Park. Her graduate research focused on marine protected area (MPA) social science; she analyzed efforts to include stakeholder input into MPA planning. Bachus received her M.S. in Sustainable Development and Conservation Biology in August of 2003.

Naomi Lundberg will be located in the NOAA Office of External Affairs for the Office of Oceanic and Atmospheric Research (OAR), under the supervision of Regina Jackson. Functions of the Office of External Affairs include gathering and preparing information for Congress, networking with constituents and OAR laboratories, and developing partnerships with other NOAA offices. Lundberg received a B.S. in Biology from Florida International University in Miami in 1999. Following graduation, she served as an AmeriCorps VISTA volunteer, working with the Marine Studies Program for the Coral Shores High School in the Upper Florida Keys, and then spent one semester at the Arava Institute for Environmental Studies in Israel, studying water management and protection of the Coral Reefs of the Gulf of Aqaba. Lundberg will graduate with a J.D. from Georgetown University's Law School in May of 2005, with a specialty in Natural Resource Management.

Eric Nagel will work within the House of Representatives Coast Guard and Maritime Transportation Subcommittee under the supervision of John Rayfield. His work will focus on legislation addressing the problem of invasive species introduction via ballast water as well as other marine and Coast Guard-related issues. Nagel received his B.S. degree in Biology with a minor in Marine Science from the University of North Carolina at Chapel Hill in 1999. Following graduation, he joined the Peace Corps and worked as an agricultural extension agent to subsistence-level farmers in western Kenya for two years. He is currently completing his M.S. degree in Environmental Science at Horn Point Laboratory and is advised by Dr. Jeff Cornwell. Eric's thesis research has examined rates, magnitudes and controls of nitrogen fixation in Florida Bay and how this nutrient source compares with external loading. He anticipates graduating in December 2004.

Pamela Toschik will spend her fellowship year with the National Science Foundation's Office of Polar Programs. Her work will focus on management and policy related to research in Antarctica. Toschik received her B.S. in Natural Resources from Cornell University in 2001. She is currently working on her M.S. degree in Marine, Estuarine and Environmental Sciences at the University of Maryland, College Park. Her research, conducted with Barnett Ratter of the USGS-Patuxent Wildlife Research Center, focuses on the effects of contaminants and habitat quality on osprey nest site use and reproductive success in the Delaware Bay. Toschik plans to graduate in December 2004.

Knauss Fellowships run from February 1 to January 31 and pay a stipend of $32,000 plus $6000 for health insurance, moving and travel. They are awarded through Sea Grant programs across the nation. In Maryland, the application deadline for the 2005 Knauss Fellowship program is April 6th, 2004. For more information, visit both the fellowship web site at Maryland, www.mdsg.umd.edu/Policy/knauss.html, and at the National Sea Grant office, www.nsgo.seagrant.org/Knauss.html. Those interested in applying for the fellowship should contact Susan Leet at the Maryland Sea Grant office for guidance as early as possible. She may be reached at Maryland Sea Grant, 4321 Hartwick Road, Suite 300, phone 301.403.4220, ext.13, e-mail leet@mdsg.umd.edu.

Maryland Sea Grant RFP

The Maryland Sea Grant College is seeking proposals for its next funding cycle, February 1, 2005 - January 31, 2007. The focus of this solicitation is on research in support of coastal restoration. Additional funding opportunities exist for regional research proposals that focus on specific joint priorities for Maryland, Virginia and Delaware Sea Grant. The Request for Proposals (RFP) contains a listing of coastal restoration research questions, a description of regional Sea Grant research proposals and information about the format and timetable for submitting preproposals and proposals.

Support is offered on an open, competitive basis. Principal Investigators (PIs) must be affiliated with an academic institution or research laboratory in Maryland. Co-Principal Investigators (Co-PIs) on projects can be from institutions outside of Maryland. Single investigators and multiple investigator research teams from different institutions are encouraged to apply; both small-scale pilot studies and large interdisciplinary research projects will be considered. Maryland Sea Grant encourages participation from the broad research community within Maryland, especially investigators new to the Maryland Sea Grant RFP process.

Preproposals are due March 8, 2004, at 5.00 p.m. The RFP and application materials are available on the web at www.mdsg.umd.edu/Research/RFP/. To request a paper copy of the RFP, call Maryland Sea Grant at 301.403.4220.

Savor the Bay

The UMCES Chesapeake Biological Laboratory, together with Maryland Sea Grant, sponsors a series of dinner lectures at restaurants in Solomons, Maryland, each year. Called "Savor the Bay," the series features a seafood dinner, lectures on some aspect of Chesapeake Bay science and culinary demonstrations by local chefs.

Sea Grant extension agent Jackie Takacs coordinates "Savor the Bay," which was modeled after a similar program of the same name at the Virginia Institute of Marine Science in Gloucester, Virginia. "It's a fun and interesting way for the Lab to reach out to members of the community who may not know about the kind of research we do," says Takacs.

The schedule for this year's series, focused on the blue crab, is listed below. Dinner/lectures run from 6:00-9:30 p.m.

February 23 – Dr. Thomas Miller, "If King Charles I Had Only Known about Crabs," Lighthouse Inn, Chef Kevin Pinti.

March 30 – Dr. Rodger Harvey, "The Eyes Don't Lie," DiGiovanni's Dock of the Bay, Chef Gregory Danvers.

April 13 – Dr. David Secor, "Crab Cake Blues," Stoney's Kingfishers Seafood House, Chef Forest.

Registration, which costs $40 per person, includes lecture, demonstration and a four-course meal and is available on a first-come first-serve basis. To register, visit the web at cbl.umces.edu/Public/SavortheBay.html or call Jackie Takacs at 410.326.7356.

***Chesapeake Quarterly* is also available on the web at www.mdsg.umd.edu/CQ**

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